

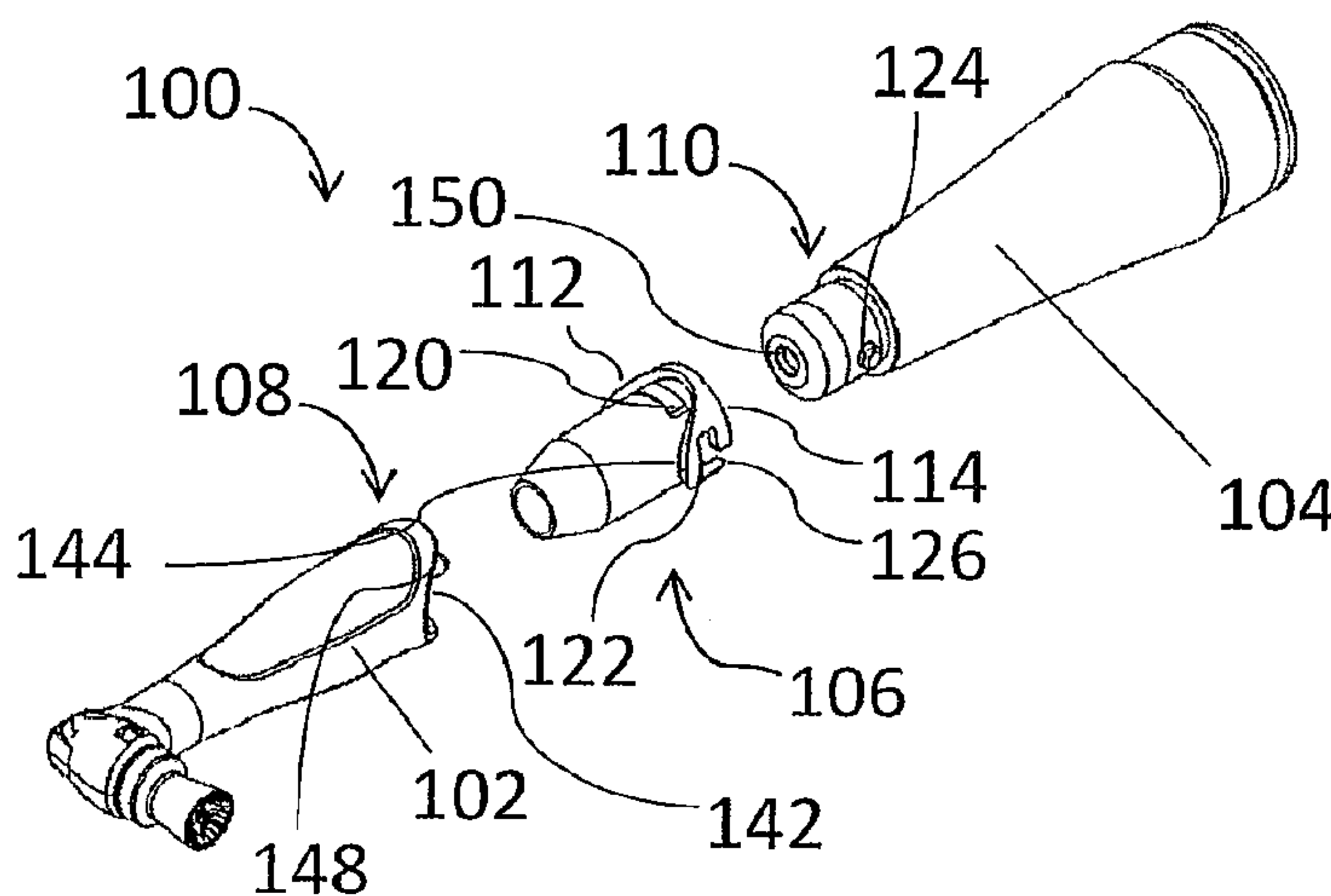


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(54) Titre : SYSTEME D'ADAPTATEUR DE DISPOSITIF DENTAIRE, SYSTEME DENTAIRE ET PROCEDE  
 D'ACTIONNEMENT D'UN SYSTEME DENTAIRE

(54) Title: DENTAL DEVICE ADAPTER SYSTEM, DENTAL SYSTEM, AND METHOD OF OPERATING A DENTAL  
 SYSTEM



(57) Abrégé/Abstract:

Provided is a dental handpiece adapter connection system, dental handpiece adapter connection method, and a dental handpiece adapter. The dental handpiece adapter includes a first portion configured to engage a dental device having a first geometry and a second portion configured to engage a dental handpiece having a second geometry. The first portion being engaged with the adapter and the second portion being engaged with the adapter permits the dental handpiece to rotate a rotatable portion of the dental device.

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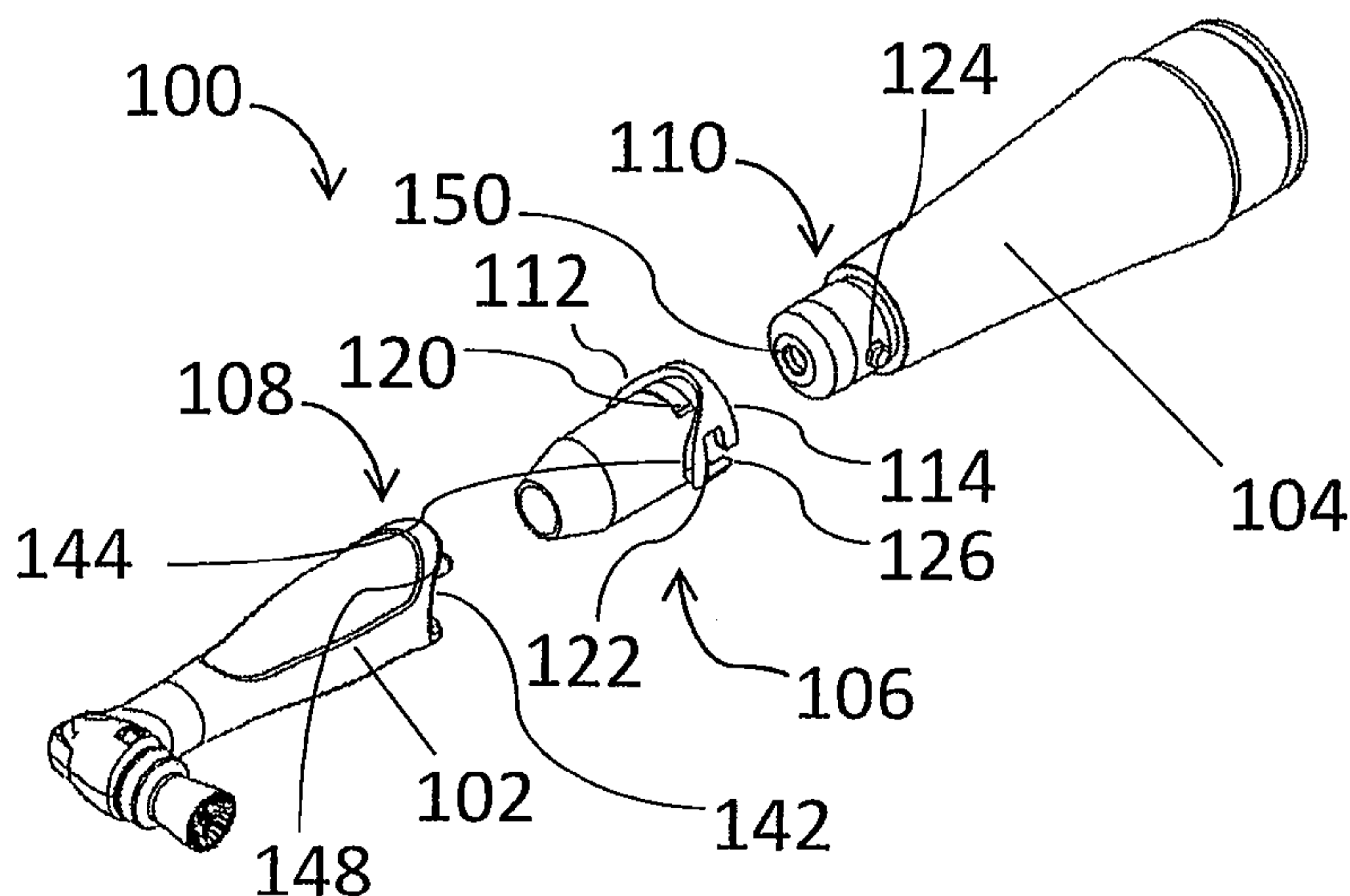


FIG - 1

(57) Abstract: Provided is a dental handpiece adapter connection system, dental handpiece adapter connection method, and a dental handpiece adapter. The dental handpiece adapter includes a first portion configured to engage a dental device having a first geometry and a second portion configured to engage a dental handpiece having a second geometry. The first portion being engaged with the adapter and the second portion being engaged with the adapter permits the dental handpiece to rotate a rotatable portion of the dental device.



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DENTAL DEVICE ADAPTER SYSTEM, DENTAL SYSTEM, AND  
METHOD OF OPERATING A DENTAL SYSTEM

[0001] Continue to [0002].

FIELD OF THE DISCLOSURE

[0002] The present disclosure is directed to dental devices. More particularly, the disclosure relates to adapters for connecting a dental device and a dental handpiece.

BACKGROUND OF THE DISCLOSURE

[0003] Generally, dental devices are exposed to undesirable substances and contaminants including, but not limited to, plaque, blood, saliva, and/or paste. Sterilizing and/or disinfecting dental devices can result in down-time for clinicians.

[0004] To reduce or eliminate down-time, modular dental devices can be utilized. Modular dental devices can include a dental prophylaxis angle (DPA) capable of being connected to a dental handpiece. The DPA can be disassembled and discarded or sterilized while the dental handpiece is more frequently used. Since there is no industry standard, these dental handpieces have interfaces that are compatible with the interfaces of certain DPAs. However, due to the various DPA designs and handpiece designs, a dental handpiece can include a geometry incompatible with the geometry of another DPA. This can result in the clinician being unable to utilize DPAs having incompatible geometries with certain handpieces that provide other benefits such as improved stability and/or other improvements. Furthermore, using multiple dental devices including

incompatible geometry can require the clinician to use multiple handpieces.

[0005] Therefore, what is needed are a dental system and method of operating a dental system having a dental device adapter system for connecting dental handpieces and dental devices.

#### SUMMARY OF THE DISCLOSURE

[0006] According to one aspect of the present disclosure, a dental device adapter system for a dental system includes a first adapter configured to engage a dental device having a first geometry and a first rotatable component, and a second adapter configured to engage a dental handpiece having a second geometry and a second rotatable component. The first adapter being engaged with the dental device and the second adapter being engaged with the dental handpiece permits rotation of the second rotatable component to rotate the first rotatable component.

[0007] According to another aspect of the present disclosure, a dental system includes a dental prophylaxis angle, a dental handpiece, and a dental device adapter system. The dental device adapter system includes a first adapter configured to engage a dental prophylaxis angle having a first geometry and a first rotatable component, and a second adapter configured to engage the dental handpiece having a second geometry and a second rotatable component. The first adapter being engaged with the dental prophylaxis angle and the second adapter being engaged with the dental handpiece permits rotation of the second rotatable component to rotate the first rotatable component.

[0008] According to yet another aspect of the present disclosure, a method of operating a dental system having a dental prophylaxis angle, a dental handpiece, and a dental device adapter system includes providing the dental device adapter system and rotating the second rotatable component thereby rotating the first rotatable component. The dental device adapter system includes a first adapter configured to engage the dental prophylaxis angle having a first geometry and a first rotatable component, and a second adapter configured to engage the dental handpiece having a second geometry and a second rotatable component. The first adapter is engaged with the dental prophylaxis angle and the second adapter is engaged with the dental handpiece.

[0009] Further aspects of the method and system are disclosed herein. The features as discussed above, as well as other features and advantages of the present disclosure will be appreciated and understood by those skilled in the art from the following detailed description and drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIGS. 1-9 show exemplary embodiments of a dental system having a dental device adapter system.

[0011] Wherever possible, the same reference numbers will be used throughout the drawings to represent the same parts.

#### DETAILED DESCRIPTION OF THE DISCLOSURE

[0012] The present disclosure now will be described more fully hereinafter with reference to the accompanying drawings, in which an exemplary embodiment of the disclosure is shown. This disclosure may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein.

[0013] Provided is a dental system and method of operating a dental system having a dental device adapter system for connecting dental handpieces and dental devices. In exemplary embodiments of the disclosure, the dental device adapter system permits clinicians to use multiple dental devices with a single dental handpiece, multiple dental handpieces with a single dental device, dental devices incompatible with dental handpieces, and/or increased modularity. For example, exemplary embodiments of the present disclosure permit clinicians to use multiple styles of a dental prophylaxis angle (DPA) with a single dental handpiece. Also, exemplary embodiments of the present disclosure permit clinicians to use multiple styles of the handpiece with a single DPA.

[0014] FIGS. 1-9 show alternate views of an exemplary embodiments of dental systems 100. Each system 100 includes a dental device (for example, a DPA, a dental drill, or other suitable dental device), a dental handpiece, and a dental device adapter system 106. In one embodiment, the dental device may be DPA 102 (shown in FIG. 1), as

disclosed in U.S. Patent Application No. 12/004,145, December 20, 2007, entitled "DENTAL PROPHYLAXIS ANGLE AND HANDPIECE ASSEMBLY". In another embodiment, the dental device may be DPA 103, as shown in FIG. 3. In one embodiment, the dental handpiece may be dental handpiece 104, as disclosed in U.S. Patent Application No. 12/004,145. In another embodiment, the dental handpiece may be dental handpiece 105, as shown in FIG. 3. Dental device adapter system 106 permits use of DPA 102 or DPA 103 to be used with dental handpiece 104 or dental handpiece 105. As will be appreciated, engagement features (for example, male parts and female parts) may be reversed in any suitable manner. For example, although the dental handpiece is shown and described as including a female engagement feature, a male engagement feature may be used. Thus, the DPA(s), the dental handpiece(s), the adapter(s), or other suitable portions of dental system 100 may be engaged by any suitable engagement features.

**[0015]** Dental device adapter system 106 can be one or more adapters capable of connecting the DPA to the dental handpiece. Dental device adapter system 106 can be of any suitable material, for example polymeric, metal, or composite. Dental device adapter system 106 may include any suitable features for operably connecting the dental handpiece to the DPA. As shown in FIGS. 2-5, dental device adapter system 106 may include a drive shaft 146 (or other suitable rotatable component) configured to engage a DPA drive shaft 148 (or other suitable rotatable component). Additionally or alternatively, as shown in FIGS. 2-5, dental device adapter system 106 may include a drive shaft 146 (or other suitable rotatable component) configured to engage a handpiece drive shaft 150 (or other suitable rotatable component).

**[0016]** In one embodiment, dental device adapter system 106 may be disassembled from the dental handpiece and/or from the DPA and autoclaved. In another embodiment, dental device adapter system 106 may include disposable parts or be entirely disposable. Dental device adapter system 106 can include a first portion 112 configured to detachably engage the DPA and a second portion 114 configured to detachably engage the dental handpiece 104. Dental device adapter system 106 can be attached to either the dental handpiece 104 or the DPA first.

[0017] The dental handpiece and/or the DPA can include alignment features for substantially permanent engagement or detachable engagement with one another (see FIGS. 4-5). Alignment features can be included on an exterior portion of the dental handpiece and/or the DPA and/or on an interior portion of the dental handpiece and/or the DPA. For example, the alignment features may include two or more recesses 142 corresponding to protrusions 144 (see FIG. 5) or a feature 124 corresponding to a notch interface 122 and a notch 126 (see FIG. 4). Alternatively, the dental handpiece and the DPA may be incompatible (see FIGS. 1-3). For example, the dental handpiece may include a first geometry 108 and the DPA may include a second geometry 110, the first geometry being incompatible with the second geometry. Likewise, the dental handpiece and the DPA may include alignment features that are incompatible.

[0018] Dental device adapter system 106 may connect any suitable DPA to any suitable dental handpiece despite the DPA and the dental handpiece being incompatible. Referring to FIGS. 1-2, in one embodiment, dental device adapter system 106 can connect DPA 102 having a first geometry 108 (for example, a swoop-like shape) or interface with dental handpiece 104 having a second geometry 110 (for example, a ring-like shape) or interface despite DPA 102 and dental handpiece 104 being incompatible. In the embodiment, dental device adapter system 106 includes first portion 112 configured to detachably engage DPA 102 and second portion 114 configured to detachably engage dental handpiece 104. First portion 112 includes protrusions 144 for engaging recesses 142 of DPA 102. Second portion 114 includes notch interface 122 and notch 126 for engaging feature 124 of dental handpiece 104. In a further embodiment, dental device adapter system 106 may be formed by two separate adapters. Any suitable combination of separate adapters may be used to form dental device adapter system 106. For example, one adapter may be a sheath and the other adapter may be a shaft extender having a tube on one end for engaging DPA drive shaft 148 and a shaft on the other end for engaging the dental handpiece. Additionally or alternatively, the shaft in the DPA drive shaft 148 may be configured to extend all the way through the adapter(s).

[0019] Referring to FIG. 3, in another embodiment, dental device adapter system 106 can connect DPA 103 having second geometry 110 (the ring-like shape) with dental

handpiece 105 having first geometry 108 (the swoop-like shape) despite DPA 103 and dental handpiece 105 being incompatible. In the embodiment, dental device adapter system 106 includes first portion 116 configured to detachably engage DPA 103 and second portion 118 configured to detachably engage dental handpiece 105. First portion 116 includes feature 124 for engaging notch interface 122 and notch 126 of DPA 103. Second portion 118 includes recesses 142 for engaging protrusions 144 of dental handpiece 105.

[0020] Dental device adapter system 106 may connect compatible DPAs and dental handpieces, thereby extending the length of system 100. Referring to FIG. 4, in another embodiment, dental device adapter system 106 can connect DPA 103 having the second geometry 110 (for example, the ring-like shape) with dental handpiece 104 having a second geometry 110 (for example, a ring-like shape). In the embodiment, dental device adapter system 106 includes first portion 116 configured to detachably engage DPA 103 and second portion 114 configured to detachably engage dental handpiece 104. First portion 116 includes feature 124 for engaging notch interface 122 and notch 126 of DPA 103. Second portion 114 includes notch interface 122 and notch 126 for engaging feature 124 of dental handpiece 104.

[0021] Referring to FIG. 5, in one embodiment, dental device adapter system 106 can connect DPA 102 having first geometry 108 (the swoop-like shape) with dental handpiece 105 having first geometry 108 (the swoop-like shape). In the embodiment, dental device adapter system 106 includes first portion 112 configured to detachably engage DPA 102 and second portion 118 configured to detachably engage dental handpiece 105. First portion 112 includes protrusions 144 for engaging recesses 142 of DPA 102. Second portion 118 includes recesses 142 for engaging protrusions 144 of dental handpiece 105.

[0022] Dental device adapter system 106 may include any suitable securing mechanism for releasably securing dental device adapter system 106 to the DPA. For example, dental device adapter system 106 may include one or more tabs 120 forming a friction or interference fit between dental device adapter system 106 and DPA 102 (see FIGS. 1-2, and 4). Alternatively, dental device adapter system 106 may include notch

interface 122 or bayonet style interface for securing dental device adapter system 106 to DPA 103 (see FIGS. 3 and 5). For example, interface 122 may be configured to engage feature 124 on DPA 103 by notch 126 being inserted into feature 124 and rotated. In one embodiment, the interface may be engaged without rotation of the notch in the feature. Other suitable connection methods and/or connection mechanisms may be used as the securing mechanism. For example, pads, ribs portions, threads, springs, buttons, temporary adhesive, and/or combinations thereof may secure dental device adapter system 106 to the DPA.

[0023] Dental device adapter system 106 may include any suitable securing mechanism for releasably securing dental device adapter system 106 to the dental handpiece. For example, dental device adapter system 106 may be engaged by tab(s) 120 forming a friction or interference fit between dental device adapter system 106 and dental handpiece 105 (see FIGS. 3 and 5). Alternatively, dental device adapter system 106 may include feature 124 for engaging notch interface 122 or bayonet style interface of DPA 102 (see FIGS. 1-2 and 4). Other suitable connection methods and/or connection mechanisms may be used as the second securing mechanism. For example, pads, ribs portions, threads, springs, buttons, temporary adhesive, and/or combinations thereof may secure dental device adapter system 106 to the dental handpiece.

[0024] Dental device adapter system 106 may include additional mechanisms for permanently or detachably securing dental device adapter system 106 to the DPA, securing dental device adapter system 106 to the dental handpiece, securing portions of dental device adapter system 106, securing dental device adapter system 106 to any other suitable apparatus, and/or securing combinations thereof. The additional securing mechanism may be any suitable alignment mechanism, geometric configuration, and/or other suitable securing mechanism. For example, the additional securing mechanism may be based upon adhesive, friction, threading, magnets, snap features, canted coil spring and matching groove, collets, dovetail interfacing, flaring, other suitable securing techniques, and/or their combination. In one embodiment, a cam (not shown) may be actuated by depressing a spring-loaded button. The cam can rotate thereby releasing dental device adapter system 106 from the DPA, the dental handpiece, and/or another

suitable apparatus. Additionally or alternatively, the cam can rotate thereby separating the portions of the dental device adapter system 106.

**[0025]** Referring to FIGS. 6-9, in one embodiment, dental device adapter system 106 may include at least two adapters. Referring to FIG. 6, a first adapter 130 is configured to engage DPA 102 having first geometry 108 (the swoop-like shape). A second adapter 132 is configured to engage dental handpiece 104 having second geometry 110 (the ring-like shape). First adapter 130 and second adapter 132 may be permanently or releasably secured to one another by any suitable mechanism, thereby operably connecting DPA 102 to dental handpiece 104. Referring to FIG. 7, a first adapter 134 is configured to engage DPA 103 having second geometry 110 (the ring-like shape). A second adapter 136 is configured to engage dental handpiece 105 having first geometry 108 (the swoop-like shape). First adapter 134 and second adapter 136 may be permanently or releasably secured to one another by any suitable mechanism at an interface, thereby operably connecting DPA 103 to dental handpiece 105. As will be appreciated, a first adapter and a second adapter may likewise operably connect DPA 102 to dental handpiece 105 or DPA 103 to handpiece 104.

**[0026]** Referring to FIGS. 8 and 9, in one embodiment, dental device adapter system 106 includes at least three adapters. Referring to FIG. 8, dental device adapter system 106 may include first adapter 130 configured to engage DPA 102 having first geometry 108, second adapter 132 configured to engage dental handpiece 104 having second geometry 110, and a third adapter 138 configured to engage first adapter 130 and second adapter 132. Third adapter 138 may be secured permanently or releasably to first adapter 130 and/or second adapter 132, thereby operably connecting DPA 102 to dental handpiece 104. Referring to FIG. 9, dental device adapter system 106 may include first adapter 134 configured to engage DPA 103 having second geometry 110, second adapter 136 configured to engage dental handpiece 105 having first geometry 108, and a third adapter 140 configured to engage first adapter 134 and second adapter 136. Third adapter 140 may be secured permanently or releasably to first adapter 134 and/or second adapter 136, thereby operably connecting DPA 103 to dental handpiece 105. As will be appreciated, a third adapter may likewise engage the first adapters 130, 134 and the second adapters

132, 136 that operably connect DPA 102 to dental handpiece 105 or DPA 103 to handpiece 104.

[0027] Furthermore any suitable number of adapters may be included in dental device adapter system 106. For example, four, five, or more adapters may be included. In embodiments where adapters provide specific features, more adapters may be desirable. However, using more adapters requires more material cost and can increase risk of mechanical failure.

[0028] Other features may be provided by dental device adapter system 106. For example, dental device adapter system 106 may extend dental system 100 in a substantially axial direction. Alternatively, dental device adapter system 106 may extend dental system 100 in a direction other than a substantially axial direction. For example, dental device adapter system 106 may extend dental system 100 in an angled orientation.

[0029] Dental device adapter system 106 may permit flexible manipulation of dental system 100 by dental device adapter system 106 including a flexible/elastomeric material and a flexible drive shaft.

[0030] While only certain features and embodiments of the invention have been shown and described, many modifications and changes may occur to those skilled in the art (for example, variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters (for example, temperatures, pressures, etc.), mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited in the claims. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Furthermore, in an effort to provide a concise description of the exemplary embodiments, all features of an actual implementation may not have been described (i.e., those unrelated to the presently contemplated best mode of carrying out the invention, or those unrelated to enabling the claimed invention). It should be appreciated that in the development of any such actual implementation, as in

any engineering or design project, numerous implementation specific decisions may be made. Such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure, without undue experimentation.

**Claims:**

1. An adapter system for coupling an angled dental device to a dental handpiece, comprising:

a first adapter having a first end configured to engage a first rotatable component of the angled dental device, the first end of the first adapter comprises an external surface comprising a first geometry complementary to and engageable with an external surface of the angled dental device;

a second adapter having a first end configured to engage a second rotatable component on the dental handpiece, the first end of the second adapter comprises an external surface comprising a second geometry complementary to and engageable with an external surface of the dental handpiece;

a rotatable drive member extending between the first end of the first adapter and the first end of the second adapter to rotatably engage the first rotatable component and the second rotatable component;

the first geometry comprising two or more curved protrusions on the external surface of the first end of the first adapter, the curved protrusions corresponding to and compatible with curved recesses on the external surface of the angled dental device;

the second geometry comprising a circular cross-section corresponding to a circular cross-section of the external surface of the dental handpiece; and

at least one intermediate adapter configured to engage a second end of the first adapter and a second end of the second adapter;

wherein the first end of the first adapter being engaged with the angled dental device and the second end of the first adapter being engaged with a first end of the at least one intermediate adapter, and a second end of the at least one intermediate adapter engaged with the second end of the second adapter and the rotatable drive member engaged with the second rotatable component enables rotation of the second rotatable component to rotate the first rotatable component operably connecting the angled dental device and the dental handpiece; and

wherein the external surface of the angled dental device and the external surface of the dental handpiece are not directly compatible.

2. The adapter system of claim 1, wherein the angled dental device is a dental prophylaxis angle.
3. The adapter system of claim 2, wherein the first adapter is configured to detachably engage the dental prophylaxis angle.
4. The adapter system of claim 1, wherein the second adapter is configured to detachably engage the dental handpiece.
5. The adapter system of claim 1, wherein the dental adapter system extends the dental system in a substantially axial direction.
6. The adapter system of claim 1, wherein the dental adapter system extends the dental system in a direction other than a substantially axial direction.
7. The adapter system of claim 1, wherein the dental adapter system includes an elastomeric material permitting flexible manipulation of the dental adapter system.
8. The adapter system of claim 1, wherein the rotatable component is a flexible drive shaft.
9. The adapter system of claim 1, wherein the angled dental device is a dental drill.
10. The adapter system of claim 1, wherein the first geometry includes a notch corresponding to a notch interface.
11. The adapter system of claim 1, wherein the second geometry includes a notch interface corresponding to a notch.
12. The adapter system of claim 1, wherein the first geometry is incompatible with the second geometry.

13. A dental system, comprising:
- a dental prophylaxis angle;
  - a dental handpiece; and
  - a dental adapter system, comprising:
    - a first adapter having a first adapter end configured to engage a first rotatable component of the dental prophylaxis angle, the first adapter end comprises an external surface comprising a first geometry complementary to and engageable with an external surface of the dental prophylaxis angle; and
    - a second adapter having a second adapter end configured to engage a second rotatable component of the dental handpiece, the second adapter end comprises an external surface comprising a second geometry complementary to and engageable with the dental handpiece;
    - a rotatable drive member extending between the first end of the first adapter and the first end of the second adapter to rotatably engage the first rotatable component of the dental prophylaxis angle and the second rotatable component of the dental handpiece;
    - the first geometry comprising two or more curved protrusions on the external surface of the first adapter corresponding to curved recesses compatible with the curved protrusions on an external surface of the dental prophylaxis angle;
    - the second geometry comprising a circular cross-section corresponding to a circular cross-section of an external surface of the dental handpiece;
    - a third adapter having the rotatable drive member extending therethrough, the third adapter configured to engage a second end of the first adapter and a second end of the second adapter;
    - wherein the third adapter being engaged with the first adapter and the second adapter enables rotation of the second rotatable component to rotate the rotatable drive member which in turn rotates the first rotatable component, operably connecting the dental prophylaxis angle to the dental handpiece; and
    - wherein the dental prophylaxis angle external surface and the dental handpiece external surface are not directly compatible.

14. The dental system of claim 13, wherein the first adapter is configured to detachably engage the dental prophylaxis angle.
15. The dental system of claim 13, wherein the second adapter is configured to detachably engage the dental handpiece.
16. An adapter system for coupling an angled dental device to a dental handpiece, comprising:
  - a first adapter having a first end configured to engage a first rotatable component of the angled dental device, the first end of the first adapter comprises an external surface comprising a first geometry complementary to and engageable with an external surface of the angled dental device;
  - a second adapter having a first end configured to engage a second rotatable component on the dental handpiece, the first end of the second adapter comprises an external surface comprising a second geometry complementary to and engageable with an external surface of the dental handpiece;
  - a rotatable drive member extending between the first end of the first adapter and the first end of the second adapter to rotatably engage the first rotatable component and the second rotatable component;
  - the first geometry comprising a circular cross-section corresponding to a circular cross-section of the external surface of the angled dental device;
  - the second geometry comprising two or more curved protrusions on the external surface of the first end of the second adapter, the curved protrusions corresponding to and compatible with curved recesses on the external surface of the dental handpiece;
  - and
  - at least one intermediate adapter configured to engage a second end of the first adapter and a second end of the second adapter;
  - wherein the first end of the first adapter being engaged with the angled dental device and the second end of the first adapter being engaged with a first end of the at least one intermediate adapter, and a second end of the at least one intermediate adapter engaged with the second end of the second adapter, and the rotatable drive member engaged with the second rotatable component enables rotation of the second

rotatable component to rotate the first rotatable component operably connecting the angled dental device and the dental handpiece; and

wherein the external surface of the angled dental device and the external surface of the dental handpiece are not directly compatible.

17. The adapter system of claim 1, wherein the rotatable drive member is comprised of a rotatable drive segment in each adapter, the rotatable drive segments capable of engaging one or more adjacent drive segments to form the rotatable drive member and to enable rotation of the second rotatable component to rotate the first rotatable component.
18. The dental system of claim 13, wherein the rotatable drive member further comprises a rotatable drive segment in each adapter, the rotatable drive segments capable of engaging one or more adjacent drive segments to form the rotatable drive member and to enable rotation of the second rotatable component to rotate the first rotatable component.
19. The adapter system of claim 16, wherein the rotatable drive member is comprised of a rotatable drive segment in each adapter, the rotatable drive segments capable of engaging one or more adjacent drive segments to form the rotatable drive member and to enable rotation of the second rotatable component to rotate the first rotatable component.
20. The adapter system of claim 16, wherein the first geometry includes at least two separate recesses.
21. The adapter system of claim 16, wherein the second geometry includes at least two separate recesses.

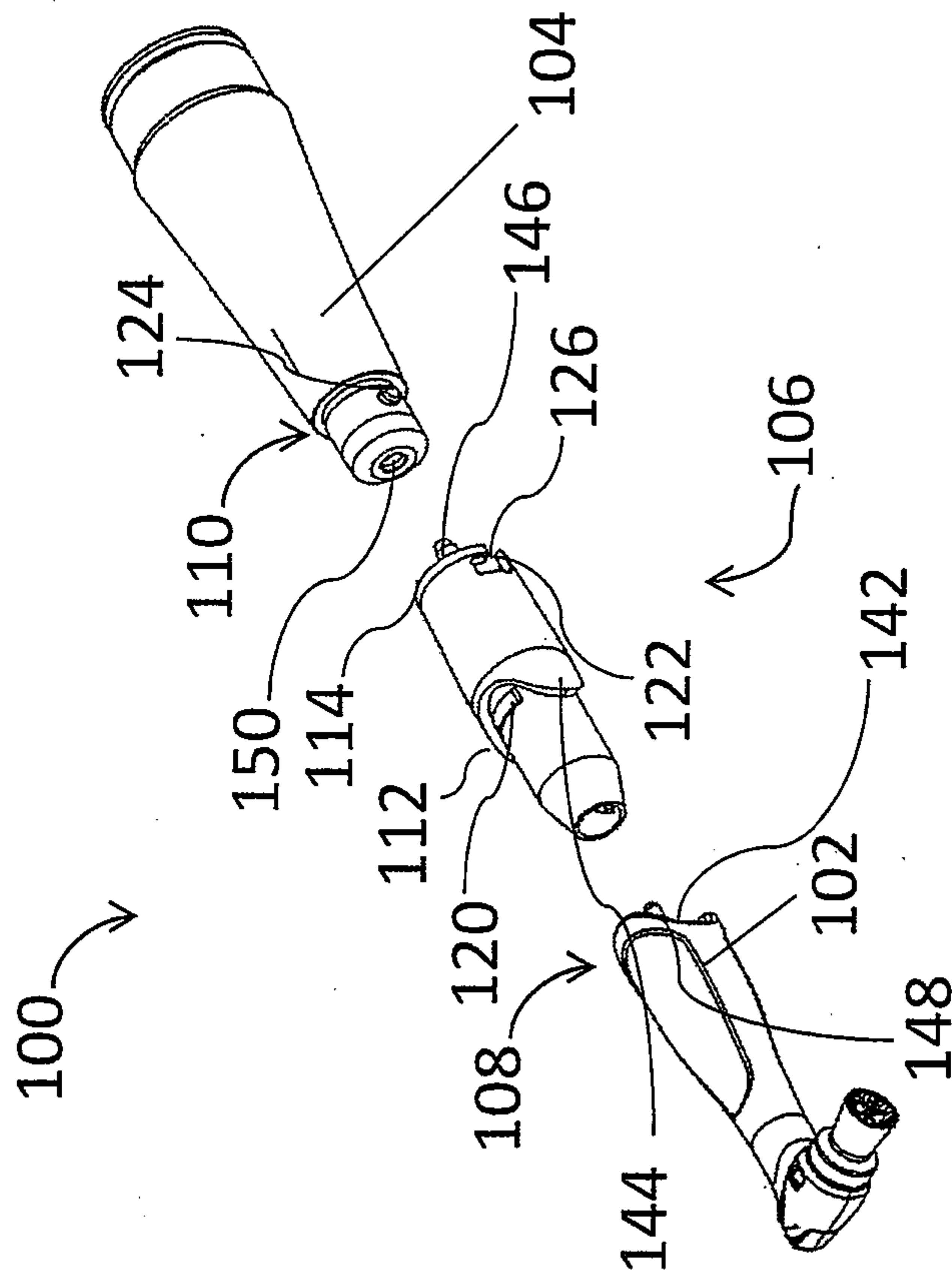


FIG - 2

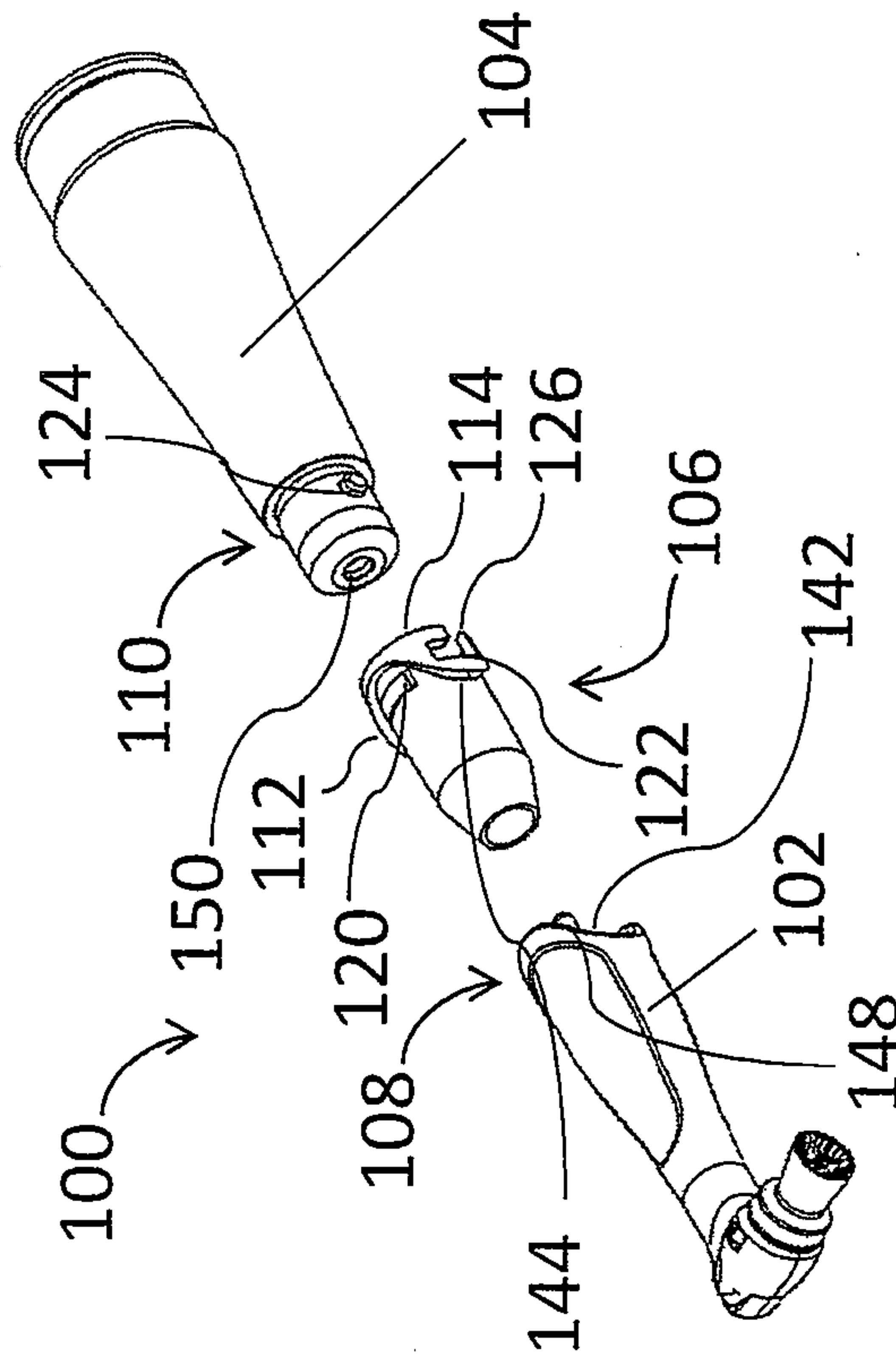


FIG - 1

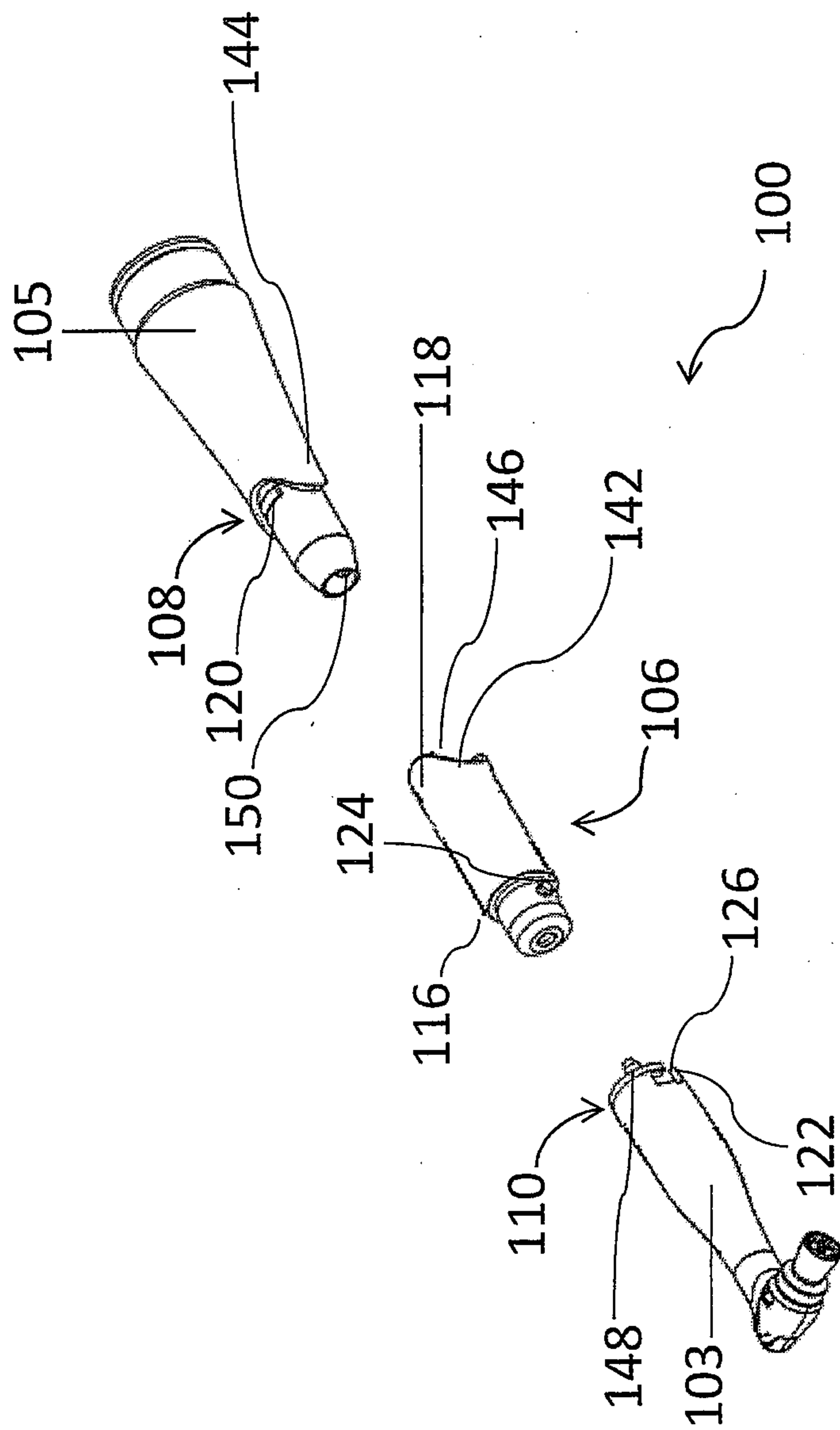
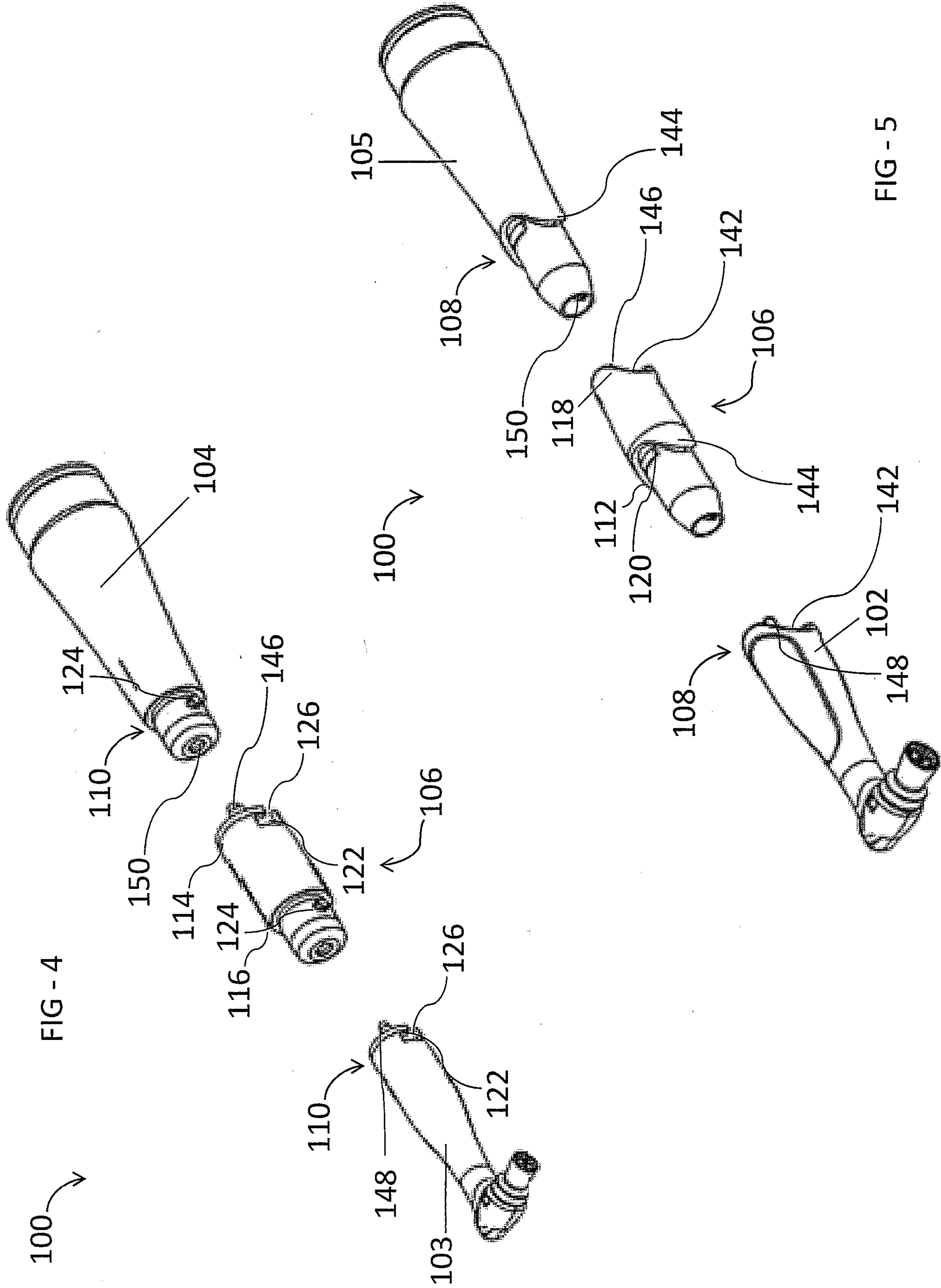
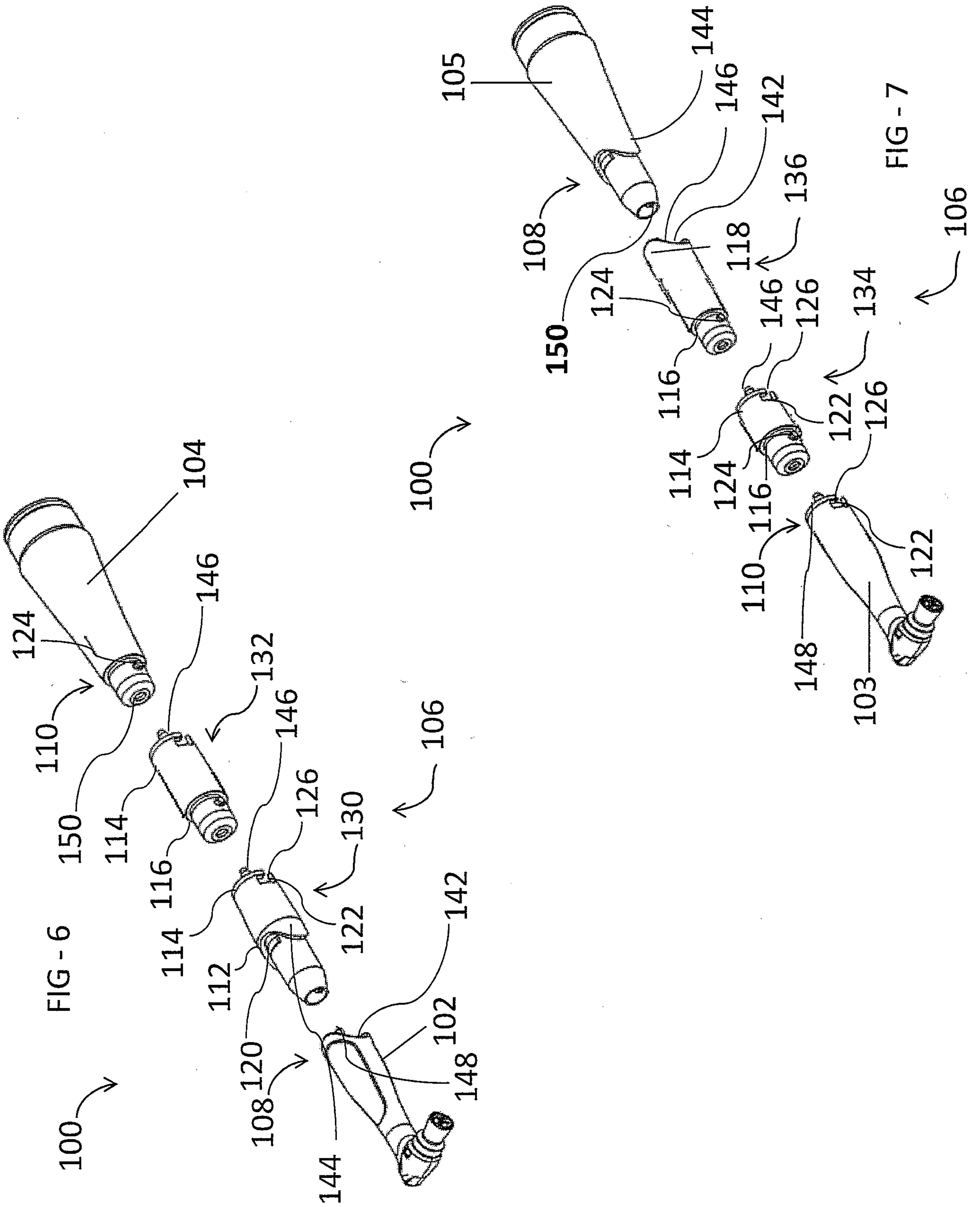


FIG - 3





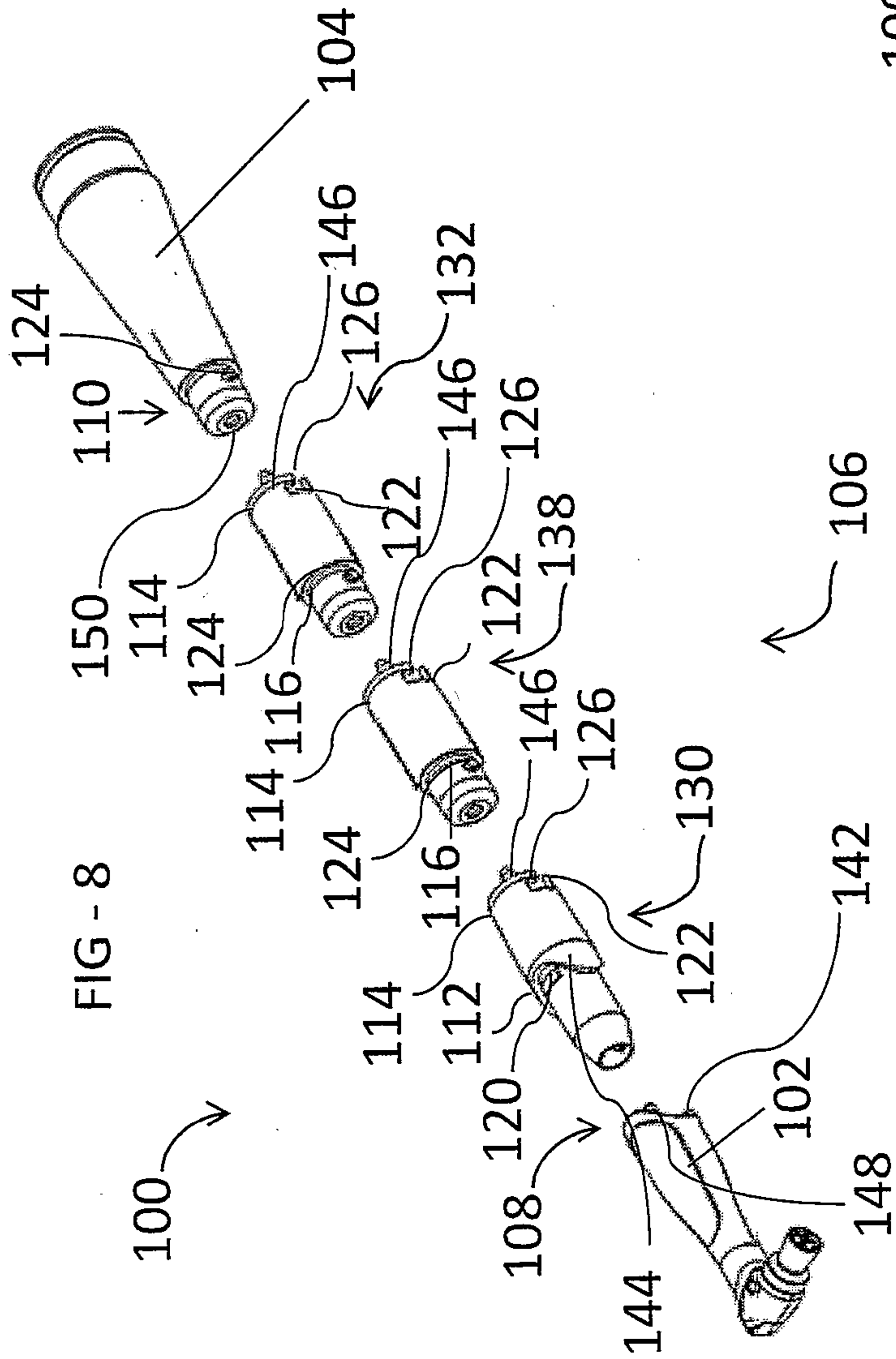


FIG - 8

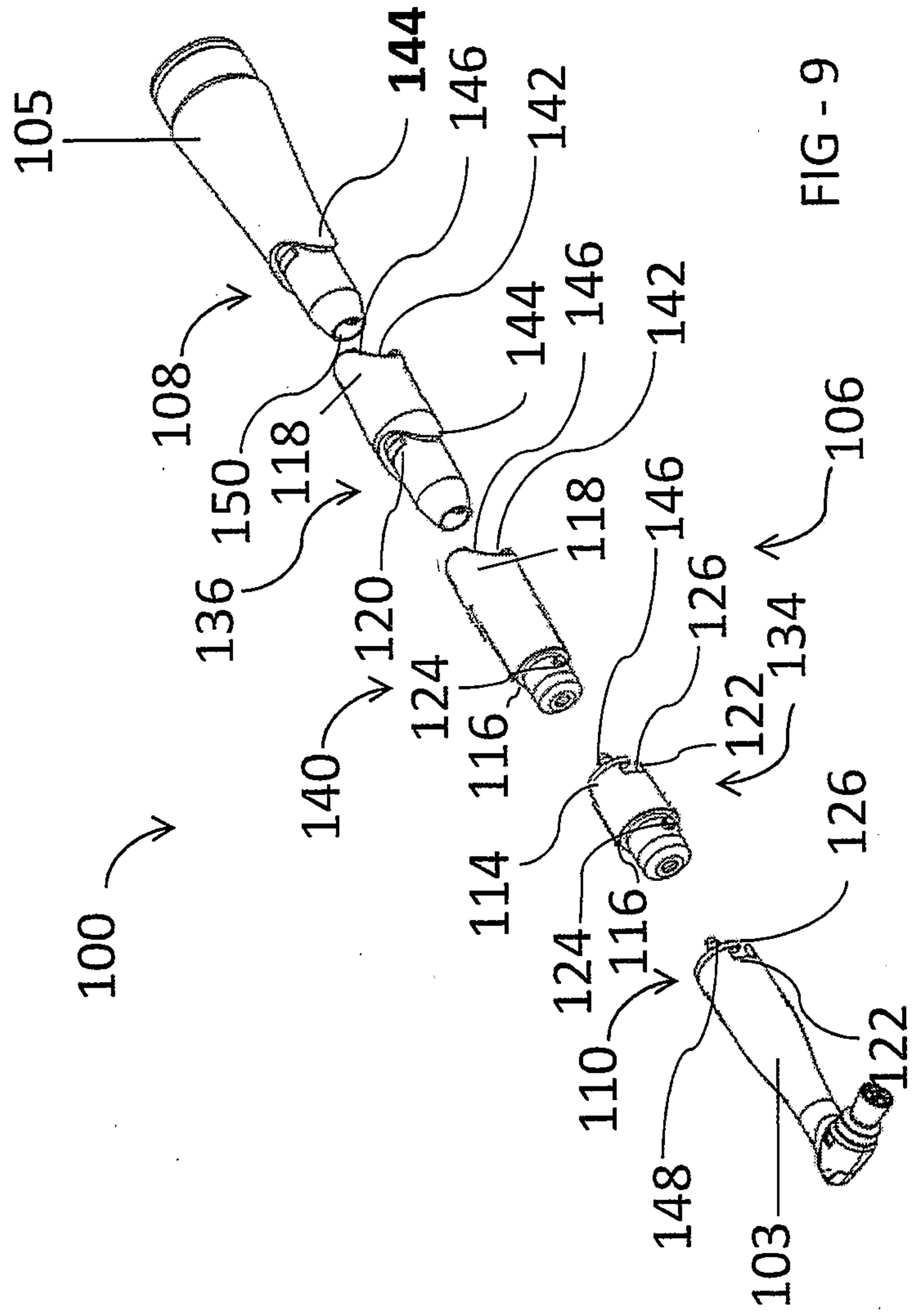


FIG - 9

